RELATIVE ABUNDANCE, SEASONAL DISTRIBUTION, AND SPECIES COMPOSITION OF DEMERSAL FISHES OFF LOUISIANA AND TEXAS, 1962–1964[1]

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ABSTRACT

Demersal fishes were collected monthly with a shrimp trawl at 33 to 60 stations in 7 to 110 m (4–60 fath) between the Mississippi River Delta and the United States-Mexico border from 1962 through 1964. Catches were generally two to five times greater off Louisiana than off Texas, with the greatest differences occurring in the shallowest waters.

Differences in total catches between stations within each depth off Texas and Louisiana, between day and night tows, and between years generally were not significant. Seasonal differences in catches were great off each coast.

The greatest catches off Louisiana were made in the winter and summer, and those off Texas were in the summer and fall. The largest catches were made between 7 and 46 m (4–25 fath) depths off Louisiana, and 27 and 110 m (15–60 fath) depths off Texas.

Atlantic croaker, *Micropogon undulatus* and longspine porgy, *Stenotomus caprinus*, constituted nearly half of the total catch. Atlantic croaker, longspine porgy, sand seatrout, *Cynoscion arenarius* and sea catfish, *Galeichthys felis*, were most abundant off Louisiana; longspine porgy, Atlantic croaker, inshore lizardfish, *Synodus foetens* and silver seatrout, *Cynoscion nothus*, dominated the catches off Texas.

INTRODUCTION

Before 1952, exploitation of many species of small demersal fishes was negligible in the northwestern Gulf of Mexico. Since then, however, a fishery for these species has developed in the north central Gulf. In 1967, this bottom trawl fishery caught 43,500 metric tons while an esitmated 590,000 metric tons were caught incidentally and discarded during shrimping operations (Bullis and Carpenter 1968). Today these fishes are processed only for animal food and fertilizer, but their potential value is even greater because of recent developments in the processing of fishes for human consumption as fish protein concentrate.

Several studies on the occurrence, abundance and distribution of demersal fishes on the Continental Shelf of the northwestern Gulf of Mexico were reported

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during the last 35 years. Investigations of the seasonal abundance of fishes were made in waters less than 27 m (15 fath) deep off Port Aransas, Texas (Gunter 1945; Miller 1965; Hoese *et al.* 1968) and Barataria Bay, Louisiana (Gunter 1936, 1938). The sampling by Gunter (1936, 1938, 1945), however, was in waters, never over, and usually much shallower than, 18 m (10 fath). In 1950–51, Hildebrand (1954) completed a general survey of fish abundance over the Continental Shelf in waters deeper than 27 m (15 fath) off Texas and Louisiana. However, no direct seasonal comparisons were attempted because samples were not taken throughout a year at the same stations and eleven different shrimp boats using trawls that ranged in width from 24 to 40 m (85–135 ft) were used in the study.

Distributions of fish species in the northwestern Gulf were listed in several reports (Springer and Bullis 1956; Hoese 1958; Bullis and Thompson 1965) and the size and species composition of the fish caught by the commercial fleet in the northern Gulf of Mexico were reported by Roithmayr (1965) and Gunter (1967).

The Soviet Union and Cuba jointly surveyed fish populations on the Continental Shelf of the northern Gulf of Mexico during four months in 1963–64 (Sal'nikov 1966). They trawled for concentrations of fish that had been detected with electronic gear. The sampling pattern was not reported but some general conclusions were made about the bathymetric distribution of fish concentrations. Sampling in these investigations over the last 35 years was not as extensive, or intensive, or both, as in our study.

In January 1962, personnel of the Bureau of Commercial Fisheries, Galveston, Texas, began a survey of fishes and crustaceans on the Continental Shelf in the northwestern Gulf of Mexico between the Mississippi River Delta and Brownsville, Texas. Stations were in depths between 14 m (7.5 fath) and 110 m (60 fath). Sampling continued through 1963 and 1964, but at a reduced number of stations between the 7 m (4 fath) and 73 m (40 fath) depth contours. Our sampling permitted the acquisition of data on seasonal, bathymetric, and areal distributions of demersal fishes. This information was analyzed: (1) to provide the fishing industry with information on the relative abundance and seasonal distribution of the demersal fishes caught (species combined) and (2) to denote species composition of the catches.

STUDY AREA AND SAMPLING METHODS

Sampling stations were established in the coastal waters of Louisiana and Texas along eight depth contours. Station locations, depth zones, and coastal regions are shown in Figure 1. The depth zones, determined arbitrarily, were: inner zone, 2–18 m (1–10 fath); middle zone, 20–55 m (11–30 fath); and outer zone, 57–110 mm (31 to 600 fath). Samples were collected during only one or two years at some stations. The location of each station and years of sampling are given in Table 1. Stations in the first column (W) were off Texas and stations in the second column (E) off Louisiana.

Samples were taken monthly from January 1962 through December 1964, with a 14-m (45-ft) wide, flat trawl fitted with rollers. The stretched mesh of the net was 6 cm (2.3 inches) throughout and the towing speed was about 3.0 knots. Tows were of about 1-hr duration and began on arrival at a station regardless of time of day. The amounts of fish caught from tows of longer or shorter duration were adjusted to catch per hour. Each tow was categorized as either

TABLE 1

Location, depth, and year of sampling at each station off the Texas and Louisiana coast, 1962 through 1964

Station (W.)	Latitude (North)	Longitude (West)	Depth		Years sampled			Station (E.)	Latitude (North)	Longitude (West)	Depth		Years sampled		
			M.	Fm.	1962	1963	1964				M.	Fm.	1962	1963	1964
1	29° 01′	95° 05′	14	7.5	X	X	X	1	29° 22′	93° 20′	14	7.5	X	X	X
2	28° 40′	94° 56′	27	15	X	X	X	2	28° 46′	93° 20′	27	15	X	X	X
3	28° 18′	94° 46′	46	25	X	X	X	3	28° 28′	93° 20′	46	25	X	X	X
4	28° 05′	94° 41′	64	35	X	.	.	4	28° 11′	93° 20′	64	35	X	.	.
5	27° 58′	94° 38′	82	45	X	.	.	5	28° 06′	93° 20′	82	45	X	.	.
6	27° 55′	94° 36′	110	60	X	X	.	6	27° 59′	93° 20′	110	60	X	.	.
7	27° 44′	95° 30′	110	60	X	.	.	7	28° 02′	92° 25′	110	60	X	.	.
8	27° 49′	95° 32′	82	45	X	.	.	8	28° 10′	92° 25′	82	45	X	.	.
9	27° 54′	95° 35′	64	35	X	.	.	9	28° 16′	92° 25′	64	35	X	.	.
10	28° 04′	95° 40′	46	25	X	.	.	10	28° 32′	92° 25′	46	25	X	X	X
11	28° 17′	95° 46′	27	15	X	.	.	11	28° 55′	92° 25′	27	15	X	X	X
12	28° 34′	95° 55′	14	7.5	X	.	.	12	29° 12′	92° 25′	14	7.5	X	X	X
13	28° 02′	96° 46′	14	7.5	X	.	.	13	28° 55′	91° 30′	14	7.5	X	.	.
13a	28° 19′	96° 21′	14	7.5	.	X	X	14	28° 40′	91° 30′	27	15	X	.	.
14	27° 54′	96° 37′	27	15	X	.	.	15	28° 29′	91° 30′	46	25	X	.	.
14a	28° 07′	96° 14′	27	15	.	X	X	16	28° 20′	91° 30′	64	35	X	.	.
15	27° 47′	96° 30′	46	25	X	.	.	17	28° 11′	91° 30′	82	45	X	.	.
15a	27° 57′	96° 07′	46	25	.	X	X	18	28° 06′	91° 30′	110	60	X	.	.
16	27° 41′	96° 23′	64	35	X	.	.	19	28° 00′	90° 35′	110	60	X	.	.
17	27° 37′	96° 20′	82	45	X	.	.	20	28° 12′	90° 35′	82	45	X	.	.
18	27° 32′	96° 14′	110	60	X	.	.	21	28° 16′	90° 35′	64	35	X	.	.
19	27° 01′	96° 32′	110	60	X	.	.	22	28° 23′	90° 35′	46	25	X	X	X
20	27° 04′	96° 42′	82	45	X	.	.	23	28° 34′	90° 35′	27	15	X	X	X
21	27° 06′	96° 48′	64	35	X	.	.	24	28° 54′	90° 35′	14	7.5	X	X	X
22	27° 08′	96° 56′	46	25	X	.	.	25	29° 10′	89° 42′	14	7.5	X	X	X
22a	27° 21′	96° 50′	46	25	.	X	X	26	29° 05′	89° 42′	27	15	X	X	X
23	27° 12′	97° 08′	27	15	X	.	.	27	28° 59′	89° 42′	46	25	X	X	X

TABLE 1—Continued

Location, depth, and year of sampling at each station off the Texas and Louisiana coast, 1962 through 1964

Station (W.)	Latitude (North)	Longitude (West)	Depth		Years sampled			Station (E.)	Latitude (North)	Longitude (West)	Depth		Years sampled		
			M.	Fm.	1962	1963	1964				M.	Fm.	1962	1963	1964
23a	27° 36′	96° 55′	27	15	.	X	X	28	28° 51′	89° 42′	64	35	X	.	.
24	27° 15′	97° 19′	14	7.5	X	.	.	29	28° 45′	89° 42′	82	45	X	.	.
24a	27° 48′	97° 00′	14	7.5	.	X	X	30	28° 40′	89° 42′	110	60	X	.	.
25	26° 14′	97° 08′	14	7.5	X	.	.	43	28° 48′	89° 42′	73	40	.	X	.
26	26° 15′	97° 00′	27	15	X	.	.	44	29° 15′	89° 42′	7	4	.	X	X
27	26° 21′	96° 41′	46	25	X	.	.	45	29° 01′	90° 35′	7	4	.	X	X
28	26° 24′	96° 31′	64	35	X	.	.	46	28° 13′	90° 35′	73	40	.	X	X
29	26° 25′	96° 26′	82	45	X	.	.	49	29° 29′	92° 25′	7	4	.	X	X
30	26° 26′	96° 21′	110	60	X	.	.	50	28° 10′	92° 25′	73	40	.	X	.
53	29° 19′	94° 41′	7	4	.	X	X	51	28° 09′	93° 20′	73	40	.	X	.
54	28° 00′	94° 38′	73	40	.	X	X	52	29° 42′	93° 18′	7	4	.	X	X
55	29° 03′	95° 06′	7	4	.	X	X								
56	28° 23′	96° 20′	7	4	.	X	X								
57	27° 46′	96° 00′	73	40	.	X	.								
58	27° 06′	96° 45′	73	40	.	X	.								
59	27° 51′	97° 01′	7	4	.	X	X								
60	26° 34′	97° 16′	7	4	.	X	X								
62	26° 41′	96° 53′	46	25	.	X	X								

day or night, depending on whether the longest duration of towing time was during the day or night. Day was defined as extending from 30 minutes before sunrise to 30 min after sunset.

Each catch was emptied on deck and the invertebrates were removed. Total volume of the fish caught was determined by measuring with containers of known volume. The total catch was estimated to the nearest 2.3 kg (5 lb.) by multiplying weight per unit volume by the total volume of fish in the sample. A random subsample of 1.8 kg (4 lb.) in 1962 and 3.5 kg (8 lb.) in 1963–64 was taken from most catches to determine average weight and relative abundance of each species.

Subsamples, preserved by freezing in 1962 and by formalin in 1963–64, were subsequently processed at the laboratory. Total weight of each species in a subsample was recorded to the nearest 5 g (0.2 oz). Species composition was estimated by dividing the species weight in the subsample by the total weight of the subsample.

Throughout this paper, the terms, "catch," "concentration" and "abundance" refer to the weight of fish caught per hour. Most fish caught were demersal, but some pelagic species were caught and are included.

ABUNDANCE

Total catches by station, month and year are shown in Table 2. We analyzed these data to determine the differences in catch between: (1) Louisiana and Texas waters, (2) day and night tows, (3) years and (4) seasons and depth zones.

Differences Between Coastal Regions

Annual mean catch by depth and year for each coastal region is shown in Table 3. The data upon which the means are based, and on which t-tests were run, represent those stations and months within a depth contour and coastal region at which samples were taken during a particular year (Table 2). Variability because of season, time of day, and between stations within a depth and coastal region was ignored in the comparisons. Nevertheless, the mean catch at depths out

TABLE 3

Comparisons of mean annual catch between Texas and Louisiana within each depth contour and year, 1962 through 1964

Year	Depth		Average catch (pounds/hour)		Test results	
	M.	Fm.	Texas	Louisiana	d.f.	t
1962	14	7.5	68	379	103	4.30[1]
	27	15	64	307	107	5.87[1]
	46	25	109	223	113	3.92[1]
	64	35	101	184	108	2.63[1]
	82	45	103	123	106	1.14
	110	60	89	81	98	0.73
1963	7	4	52	131	89	3.88[1]
	14	7.5	67	221	78	2.41[2]
	27	15	75	271	80	2.90[1]
	46	25	76	219	87	4.54[1]
	73	40	89	121	76	1.65
1964	7	4	62	137	99	2.58[2]
	14	7.5	72	271	73	1.99[2]
	27	15	58	229	81	4.12[1]
	46	25	74	168	74	3.57[1]

[1] Significance level = 1 percent.
[2] Significance level = 5 percent.

TABLE 2—Continued

Catch in pounds[1] per hour of demersal fishes (species combined) by year, station, depth, transect, and month from Texas and Louisiana, 1962–64

(Night catches are in italics)

Year	Station	Depth		Transect number	Month											
		M.	Fm.		January	February	March	April	May	June	July	August	September	October	November	December
1962	W-16			3	85	*80*	25	120	..	50	70	80	30	50	100	*300*
	W-9			4	*95*	110	150	*135*	*70*	*150*	*200*	*75*	65	*100*	40	150
	W-4			5	*120*	90	*50*	80	*150*	40	165	..	60	300	130	*120*
	E-4	64	35	6	200	*150*	350	55	*100*	500	100	150	*75*	60	110	110
	E-9			7	*300*	150	*75*	44	..	30	50	*75*	*300*	60	800	..
	E-16			8	195	*85*	*175*	20	5	280	1,000	..	*40*	200	*253*	*165*
	E-21			9	150	20	*100*	37	*75*	*250*	200	*100*	105	*150*	*175*	1,200
	E-28			10	225	150	*210*	*85*	*40*	*20*	..	*15*	*40*	..	*250*	250
	W-29	82	45	1	..	*100*	*180*	200	..	50	..	100	80	*125*	*120*	100
	W-20			2	*85*	75	100	65	..	85	*65*	30	60	*8*	*150*	150
	W-17			3	45	*150*	*100*	25	..	*70*	70	*80*	105	300	110	..
	W-8			4	*100*	20	150	*70*	50	*76*	*210*	100	*25*	*240*	*55*	*180*
	W-5			5	*100*	80	*80*	..	*80*	150	50	130	75	200	160	..
	E-5	82	45	6	40	200	150	70	*85*	120	105	*75*	*150*	60	*40*	225
	E-8			7	*100*	..	175	33	35	*18*	100	*30*	*25*	*600*	19	*146*
	E-17			8	100	*260*	*100*	*80*	*200*	220	*200*	..	*100*	225	35	*150*
	E-20			9	*200*	*160*	*300*	20	175	*60*	500	*140*	70	*170*	*53*	100
	E-29			10	180	70	*20*	*45*	*30*	..	150	*20*	40	..	*48*	45
	W-30	110	60	1	..	*95*	50	100	..	..	..	..	110	*75*	*100*	200
	W-19			2	*50*	25	*65*	*70*	..	110	*90*	125	*60*	*70*	60	..
	W-18			3	*30*	*160*	*125*	205	..	*39*	125	*50*	*30*	60	150	..
	W-7			4	*180*	110	90	*65*	50	*36*	..	*8*	*40*	*90*	*150*	*150*
	W-6			5	..	150	*155*	65	*20*	50	13	..	120	150	45	..
	E-6	110	60	6	..	*100*	*200*	30	*200*	30	85	10	*100*	34	*36*	..
	E-7			7	*45*	..	210	*50*	150	*70*	50	*35*	90	*100*	*20*	..
	E-18			8	110	..	35	*85*	200	80	*150*	50	55	100	63	*125*
	E-19			9	*25*	*110*	50	60	125	*130*	175	*125*	90	*75*	*40*	35
	E-30			10	*175*	..	*75*	*25*	*80*	54	40	*40*	30	..	*10*	*24*
1963	W-60	7	4	1a	..	27	*75*	..	..	65	50	60	*20*	45	50	*8*
	W-59			2a	..	*50*	175	*35*	..	100	*75*	10	10	35	15	15
	W-56			3a	..	*10*	*10*	10	..	*300*	*30*	60	*175*	*75*	*15*	10
	W-55			5	..	*6*	*75*	*75*	35	8	175	25	60	22	25	*30*

TABLE 2—Continued

Catch in pounds[1] per hour of demersal fishes (species combined) by year, station, depth, transect, and month from Texas and Louisiana, 1962–64
(Night catches are in italics)

Year	Station	Depth M.	Depth Fm.	Transect number	January	February	March	April	May	June	July	August	September	October	November	December
	W-53			5a	..	10	50	20	30	12	140	15	60	30	5	25
	E-52	7	4	6	..	32		*50*	*30*	*115*	130	250	150	*45*	*15*	10
	E-49			7	..	18	75	85	175	*80*	*80*	*250*	600	*130*	*150*	70
	E-45			9	..	125	..	265	10	*400*	*280*	20		*110*	100	
	E-44			10	..	40	30	120	*150*	500	30	75	80	*160*	*40*	150
	W-24a	14	7.5	2a	8	*5*	..	*40*	..	85	45	75	75	40	25	40
	W-13a			3a	30	*70*	*15*	35	..	*100*	*320*	150	..	175	*20*	*30*
	W-1			5	*60*	*10*	50	*120*	110	80	120	50	80	35	*12*	*45*
	E-1	14	7.5	6	*26*	*50*	*175*	75	50	180	140	200	100	240	*300*	*30*
	E-12			7	3	12	46	20	*40*	75	60	*300*	80	200	200	140
	E-24			9	150	*150*	*700*	*8*	55	*80*	*90*	80	*300*	*125*	200	*1,100*
	E-25			10	*135*	300	50	130	*20*	2,000	1,200	125	*450*	*300*	25	100
	W-23a	27	15	2a	*75*	*80*	65	40	100	120	*25*	*60*	450	130	*30*	30
	W-14a			3a	45	65	*120*	50	*25*	*190*	5	*25*	*50*	*110*	*100*	*25*
	W-2			5	*30*	100	*100*	*15*	*40*	*20*	5	*40*	*100*	*100*	*60*	*75*
	E-2	27	15	6	*135*	300	*225*	10	130	*100*	130	*150*	*300*	175	70	60
	E-11			7	140	250	150	*60*	50	15	60	*125*	80	300	..	200
	E-23			9	*1,200*	*1,500*	*2,000*	..	*75*	750	*130*	*75*	800	570	200	140
	E-26			10	*180*	200	*75*	650	*35*	40	30	10	*400*	*130*	*25*	50
	W-62	46	25	1a	..	*70*	..	..	..	60	10	40	25	*75*	10	*40*
	W-22a			2a	*65*	*15*	30	35	*75*	60	3	*30*	225	40	..	15
	W-15a			3a	100	200	*35*	*75*	*70*	*190*	25	*45*	*40*	*150*	*75*	125
	W-3			5	*100*	85	*10*	65	*200*	*150*	*140*	*40*	*30*	*150*	*125*	125
	E-3	46	25	6	*120*	375	*200*	175	70	5	120	*300*	*300*	310	150	80
	E-10			7	120	350	*400*	450	..	*250*	220	*200*	*225*	240	400	*75*
	E-22			9	150	60	..	100	*150*	*200*	*100*	*30*	*300*	100	130	200
	E-27			10	185	1,000	150	*145*	30	1,000	60	*125*	*200*	250	*75*	200
	W-58	73	40	2a	*150*	70	100	*60*	..	*75*	20	100	200	*50*	*150*	*75*
	W-57			3a	40	35	..	120	*150*	175	15	125	60	*75*	80	*90*
	W-54			5	*70*	*10*	175	35	175	*80*	45	*85*	50	90	*100*	80
	E-51	73	40	6	*125*	225	100	..	40	..	*70*	25	200	*120*	35	*28*
	E-50			7	165	*300*	..	*75*	25	*15*	60	150	*150*	15	*150*	*4*
	E-46			9	160	100	100	60	250	*400*	60	*60*	200	80	*125*	*75*
	E-43			10	..	*120*	*350*	*450*	25	100	*70*	35	*4*	50	*70*	*320*

TABLE 2—Continued

Catch in pounds[1] per hour of demersal fishes (species combined) by year, station, depth, transect, and month from Texas and Louisiana, 1962–64
(Night catches are in italics)

Year	Station	Depth M.	Depth Fm.	Transect number	Month: January	February	March	April	May	June	July	August	September	October	November	December
	W-6	110	60	5	*30*	*2*	15	*4*	35	40	55	*100*	..	60	110	35
1964	W-60	7	4	1a	8	*25*	*15*	*30*	60	*75*	*50*	10	60	100	35	..
	W-59			2a	*5*	6	8	*53*	*35*	15	70	*40*	100	*150*	*80*	..
	W-56			3a	*75*	12	5	30	367	320	120	80	80	*30*	*10*	..
	W-55			5	*18*	6	15	60	40	40	*200*	*85*	*80*	*20*	*50*	*10*
	W-53			5a	..	..	25	15	18	150	60	*80*	75	65	100	15
	E-52	7	4	6	*5*	*20*	..	60	205	*350*	*150*	*200*	10	55	35	*30*
	E-49			7	18	20	..	30	40	300	*120*	30	20	*10*	85	15
	E-45			9	*150*	*1,000*	100	*75*	70	15	75	*35*	*800*	*150*	175	12
	E-44			10	90	*20*	600	60	70	*30*	60	200	300	*10*	300	80
	W-24a	14	7.5	2a	*60*	110	10	*20*	*45*	15	50	*80*	100	*30*	*35*	..
	W-13a			3a	4	15	8	20	400	200	80	160	*75*	*30*	*8*	..
	W-1			5	*8*	*8*	15	*120*	200	45	*250*	*125*	*60*	*15*	*30*	*12*
	E-1	14	7.5	6	*35*	*8*	..	40	50	*6*	*550*	*300*	70	*250*	*53*	*60*
	E-12			7	30	..	60	75	10	200	600	3,600	20	40	*475*	15
	E-24			9	*250*	*150*	93	700	15	..	160	*125*	1,000	*450*	350	15
	E-25			10	..	..		250	60	..	*300*	12	400	5	*80*	*160*
	W-23a	27	15	2a	*30*	*60*	25	30	100	200	15	*15*	65	35	*90*	*30*
	W-14a			3a	35	15	*30*	*35*	120	*40*	10	130	*20*	90	*31*	*26*
	W-2			5	*25*	175	*20*	*100*	*60*	*30*	*25*	*100*	*40*	*60*	*155*	*15*
	E-2	27	15	6	*100*	400	850	*175*	*110*	*80*	*85*	*150*	*250*	*25*	*200*	*15*
	E-11			7	*85*	..	160	*25*	35	40	30	50	*300*	500	*208*	600
	E-23			9	1,200	*160*	*460*	500	20	35	20	40	225	*200*	230	*600*
	E-26			10	50	*450*	350	*175*	300	5	*220*	30	300	85	*600*	*45*
	W-62	46	25	1a	..	..	..	*75*	45	25	*30*	40	25	*50*	*60*	24
	W-22a			2a	..	..	..	50	*50*	45	40	*60*	90	40	*95*	24
	W-15a			3a	..	..	..	*10*	35	100	*30*	8	..	*75*	*85*	*25*
	W-3			5	*125*	*125*	*170*	*130*	*35*	*200*	50	110	*135*	125	*350*	*30*
	E-3	46	25	6	..	*600*	..	400	125	40	..	300	*150*	75	225	*100*
	E-10			7	..	..	200	*250*	*200*	*300*	*300*	*125*	*125*	*400*	*525*	
	E-22			9	*50*	*110*	..	80	30	30	20	50	15	*200*	100	*30*
	E-27			10	..	..	..	175	*15*	*45*	*40*	30	*150*	350	*350*	*80*
	W-54	73	40	5	85	..	150	100	65	*20*	30	75	..	2	*85*	*60*
	E-46	73	40	9	*50*	..	..	*80*	40	100	2	..	..	*10*	80	..

to 64 m (35 fath) was significantly greater off Louisiana than off Texas each year (Table 3). Differences between the two regions were greatest in the shallow areas and least in deep water in 1962 and 1963. We did not sample at the deepest stations in 1964.

Differences Between Day and Night Catches

Several recent studies have indicated a day-night variation in the catchability of some species of fishes (Boerema 1964; de Groot 1964; Parrish *et al* 1964; Woodhead 1964; Beamish 1966; Hoese *et al.* 1968). We could not make a direct comparison of catches between day and night because samples were not taken at any one station during the day and night on the same cruise.

TABLE 4

Comparisons of mean annual catch between stations within depth contours by a series of analysis of variance tests, 1962–1964

Year	Depth M.	Depth Fm.	Coastal region	Stations at which samples were taken	Test results d.f.	Test results F values: Treatment (stations)	Test results F values: Block (month)
1962	14	7.5	Texas	5	4, 24	0.15	2.03
			Louisiana	5	4, 32	1.26	1.46
	27	15	Texas	5	4, 32	0.49	2.69[1]
			Louisiana	5	4, 25	2.52	1.62
	46	25	Texas	5	4, 36	3.85[1]	1.54
			Louisiana	5	4, 40	0.11	1.64
	64	35	Texas	5	4, 32	0.77	2.65
			Louisiana	5	4, 24	0.85	1.86
	82	45	Texas	5	4, 24	1.28	2.11
			Louisiana	5	4, 28	2.39	2.64
	110	60	Texas	5	4, 20	1.87	0.41
			Louisiana	5	4, 28	1.70	3.53[1]
1963	7	4	Texas	5	4, 32	0.59	1.56
			Louisiana	4	4, 21	0.76	1.50
	14	7.5	Texas	3	2, 16	3.10	1.99
			Louisiana	4	3, 33	1.80	0.74
	27	15	Texas	3	2, 22	1.23	1.51
			Louisiana	4	3, 27	8.21[2]	1.57
	46	25	Texas	4	3, 15	2.00	0.87
			Louisiana	4	3, 27	1.59	1.08
	73	40	Texas	3	2, 18	1.29	1.40
			Louisiana	4	3, 21	0.20	0.89
1964	7	4	Texas	5	4, 32	1.19	1.13
			Louisiana	4	3, 30	1.52	0.72
	14	7.5	Texas	3	2, 20	0.82	1.94
			Louisiana	4	3, 21	0.78	0.85
	27	15	Texas	3	2, 22	0.44	1.11
			Louisiana	4	3, 30	0.79	1.16
	46	25	Texas	4	3, 21	5.57[2]	2.48
			Louisiana	4	3, 18	4.32[1]	2.55

[1] Significance level = 5 percent.
[2] Significance level = 1 percent.

An indirect method that involved two test procedures was used to evaluate day-night differences. First, we assumed that the distribution of fishes among stations at a given depth off the coast of each state was homogeneous. This assumption of homogeneity was tested by a series of two-way analysis of variance tests (stations within a depth and coastal zone were used as treatments and the months in which samples were collected from all stations were used as blocks). Examination of the first five lines in Table 2 and the first line in Table 4 will clarify the test procedure. The assumption of homogeneity appeared valid because 26 of 30 comparisons between stations within depths yielded no significant differences (Table 4).

The second part of the indirect method involved comparisons of day and night catches made with information from adjacent stations when one sample was collected during the day and the other at night within the same week and depth (Table 5). Catches from adjacent stations in transects 5 and 6 (See Fig. 1) were not compared because of the distance between these two transects and because of the differences in catches off Texas and Louisiana. The procedure for selecting pairs of day-night samples for comparison, and the determination of their means are illustrated in Table 6. A paired t-test was used for the comparisons. Only one of the 15 sets of comparisons revealed a significant difference (Table 5). We concluded that differences between day and night catches were negligible.

A study of diel variation in catches (species combined) from 27 m (15 fath) depth and less, off Port Aransas, Texas, yielded significantly larger catches at night (Hoese *et al.* 1968). Diel patterns in catchability varied, however, among species, and also within some of the species. Though most species averaged higher catches at night, some (*Synodus foetens*, *Trichiurus lepturus*, *Poronotus burti*,

TABLE 5

Comparison of relative mean catch between day and night tows off the Louisiana and Texas coast, 1962–1964

Year	Depth M.	Depth Fm.	Average catch (pounds/hour) Day	Average catch (pounds/hour) Night	Test results d.f.	Test results t
1962	14	7.5	183	230	50	—0.74
	27	15	214	182	60	0.81
	46	25	149	198	43	—1.66
	64	35	169	142	36	0.77
	82	45	115	127	52	—0.67
	110	60	86	86	49	0.00
1963	7	4	86	107	27	—0.93
	14	7.5	170	188	35	—0.22
	27	15	143	381	27	—2.01
	46	25	124	89	18	0.75
	73	40	111	147	24	—1.39
1964	7	4	72	134	39	—1.77
	14	7.5	399	176	24	1.15
	27	15	209	143	29	1.25
	46	25	81	155	33	—3.04[1]

[1] Significance level = 1 percent.

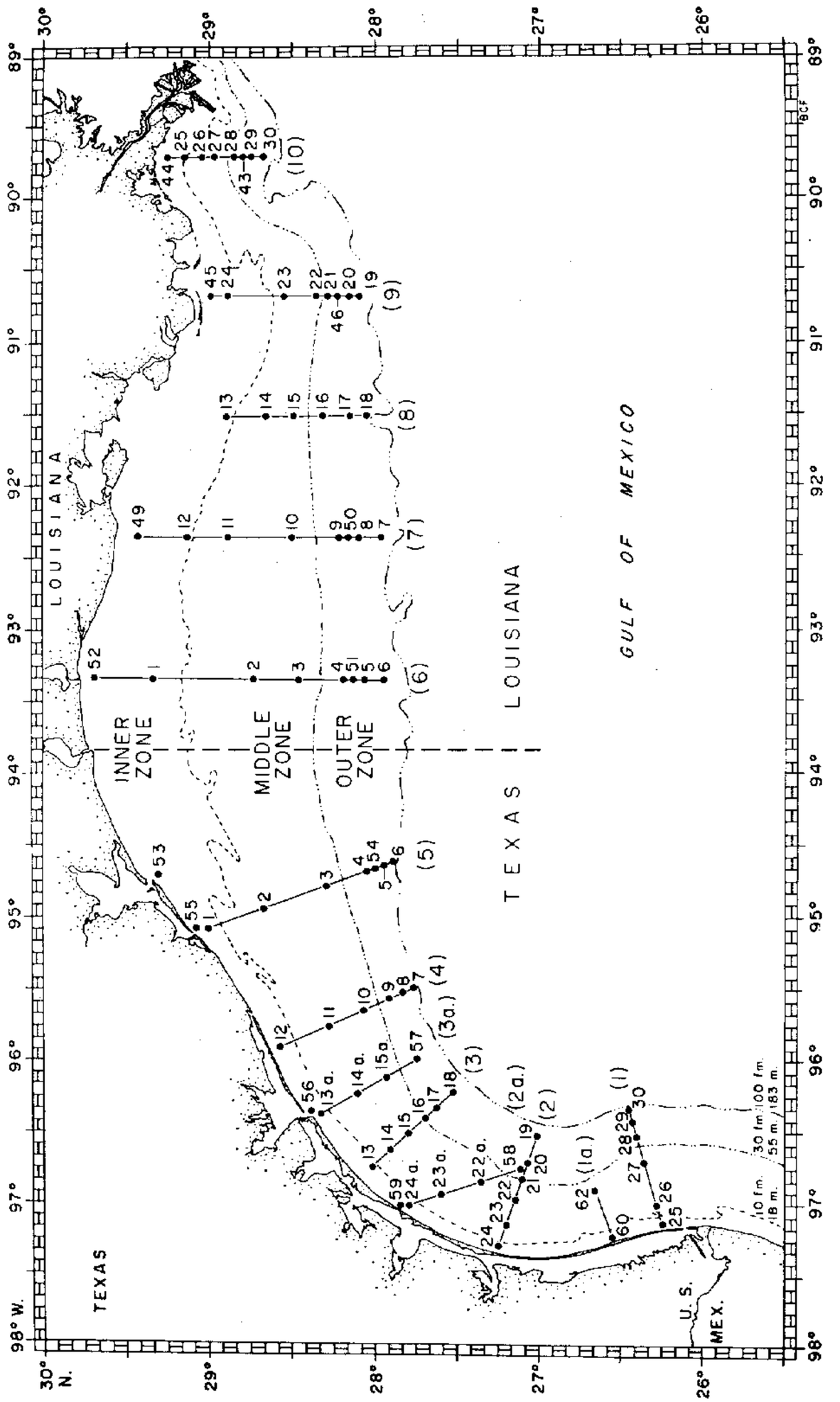

FIG. 1. Locations of stations at which samples were taken during at least 1 year, 1962–1964 (transect numbers in parentheses).

TABLE 6

Example of the pairing procedure for determining day-night differences in catchability
(Data from first 10 lines of Table 2)

Station pairs	Catch (pounds/hour) Day	Night	Station pairs	Catch (pounds/hour) Day	Night
W 25 and W 24	15	15	E 1 and E 12	45	200
	120	210		35	4
	6	50		60	250
	20	4		60	1,000
	25	25		..	..
	30	5	E 12 and E 13	40	50
	150	210		100	85
	35	200		160	150
	..	..		40	50
W 24 and W 13	25	20		450	200
	40	15		30	4
	10	10		2,500	250
	120	20		..	..
	35	30	E 13 and E 24	300	50
	3	50		225	85
	20	200		40	1,600
	30	90		300	1,250
	35	200	E 24 and E 25	300	450
W 13 and W 12	14	20		300	300
	30	10		1,200	1,600
	65	20		8	200
	35	15		20	300
	125	300		1,500	1,250
	75	40		95	125
	40	90		..	..
	100	65	Total	9,356	11,717
W 12 and W 1	80	15	Mean	183	230
	125	60		..	..
	40	225		..	..
	100	50		..	..

etc.) averaged higher catches during the day. Among the species averaging greater catches at night, one (*Galeichthys felis*) had similar day/night catches in some seasons, while two (*Micropogon undulatus* and *Leiostomus xanthurus*), that were major species in our study, were caught more during the day when the water was turbid. Some or all of the above factor's probably contributed to our finding of diel variation in capture of species combined to be nonsignificant.

Differences Between Years

Annual mean catch by station and year for the stations from which data were collected during at least 6 of the same months in all 3 years is shown in Table 7. Data were compared by a series of two-way analysis of variance tests with years used as treatments and months as blocks. Although catches at most stations varied

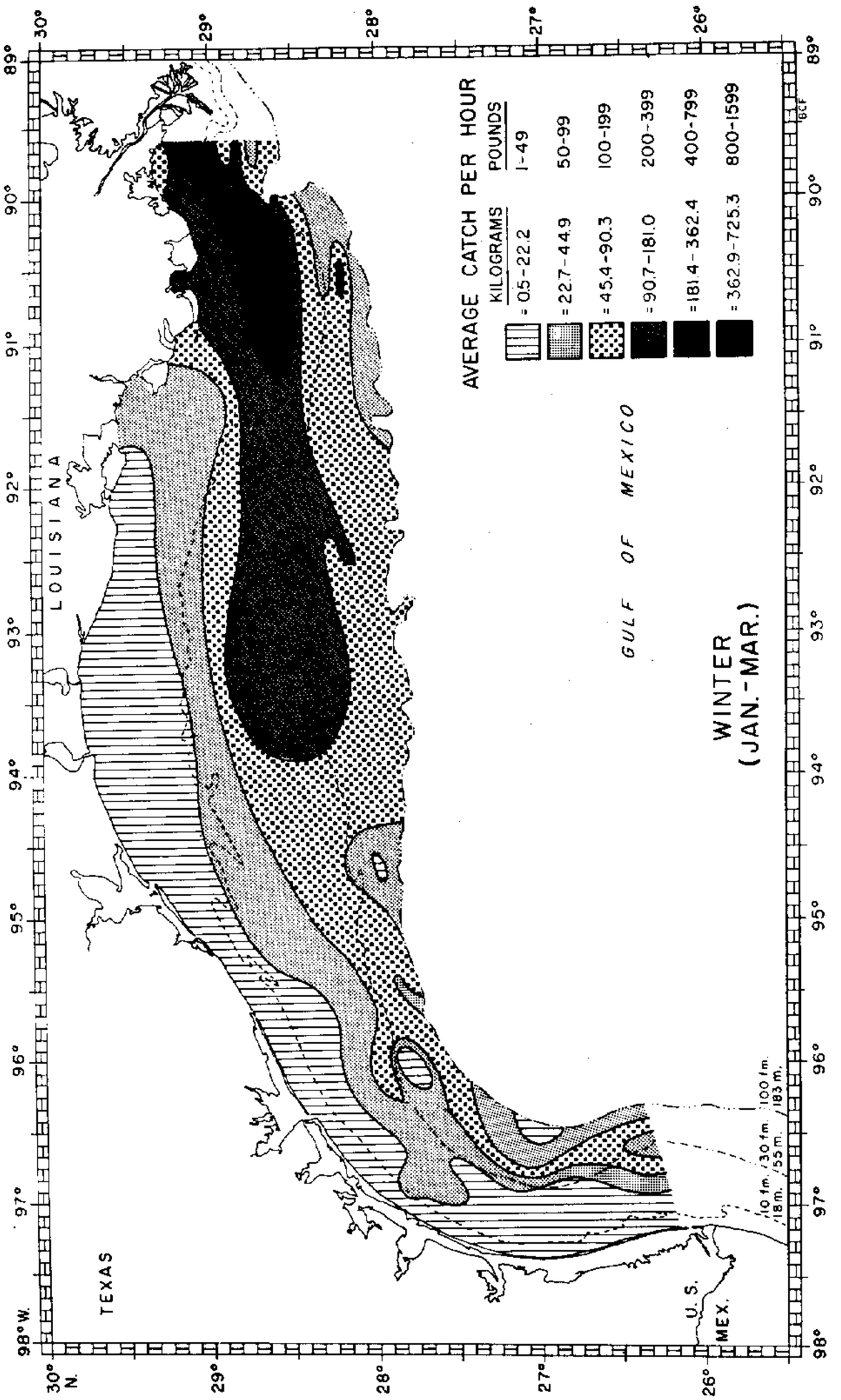

FIG. 2. Relative abundance (by weight) of demersal fishes in the winter (January-March), estimated from the average catch of all fish at each station, 1962–1964.

TABLE 7

Comparisons of average catch between years by station, 1962–1964

Depth		Coastal region	Station number	Number of the same months in which samples were taken each year	Average catch (pounds/hour)			Test results		
									F value	
M.	Fm.				1962	1963	1964	d.f.	Years	Months
14	7.5	Texas	W 1	12	78	64	74	2, 22	0.18	1.99
		Louisiana	E 1	8	221	103	132	2, 14	0.59	0.94
			E 12	8	104	78	574	2, 14	1.29	1.21
			E 24	11	638	269	301	2, 20	3.14	1.96
			E 25	6	575	325	184	2, 10	1.50	1.89
27	15	Texas	W 2	11	66	62	71	2, 20	0.06	0.91
		Louisiana	E 2	12	216	149	203	2, 22	0.74	1.57
			E 11	9	232	109	136	2, 16	2.38	4.51[1]
			E 23	9	444	755	328	2, 16	2.27	1.87
			E 26	11	423	154	230	2, 20	2.62	1.15
46	25	Texas	W 3	11	168	98	140	2, 20	2.22	0.74
		Louisiana	E 3	9	254	196	224	2, 16	0.33	1.65
			E 10	8	269	298	278	2, 14	0.06	0.74
			E 22	11	157	138	65	2, 20	1.50	0.83
			E 27	8	136	229	111	2, 14	0.64	0.63

[1] Significance level = 5 percent.

considerably between years (at most stations catches were greatest in 1962 and lowest in 1963), the differences in abundance between years were not significant at any of the stations (Table 7).

Areal Distribution of Fishes by Season

To illustrate the seasonal distribution of fishes in relation to depth zone, we drew isopleths based on the average catch at each station during a season over the three-year period (Figs. 2, 3, 4 and 5). The seasons were winter (Jan.–Mar.), spring (April–June), summer (July–Sept.), and fall (Oct.–Dec.). In each season, greatest concentrations of fish were centered off central Louisiana and appeared to spread eastward toward the Mississippi River Delta and westward into Texas waters.

Louisiana Coast—In the winter, abundance in the inner depth zone was much greater off the central coast than off the western coast of Louisiana (Fig. 2). The catches in the middle zone were large with the greatest at any depth being made off the central Louisiana coast. In the outer zone, the catches were smaller than in the middle zone.

The concentrations of fishes on the inner and middle zones in the winter apparently spread westward in the spring. Catches in the inner zone in the spring were generally less than in the winter off central Louisiana but greater than in the winter off western Louisiana (Fig. 3). In the middle zone, the fish were much less abundant in the srping, while in the outer zone, concentrations were similar to those in the winter.

Abundance in the summer along the inner zone increased greatly from the

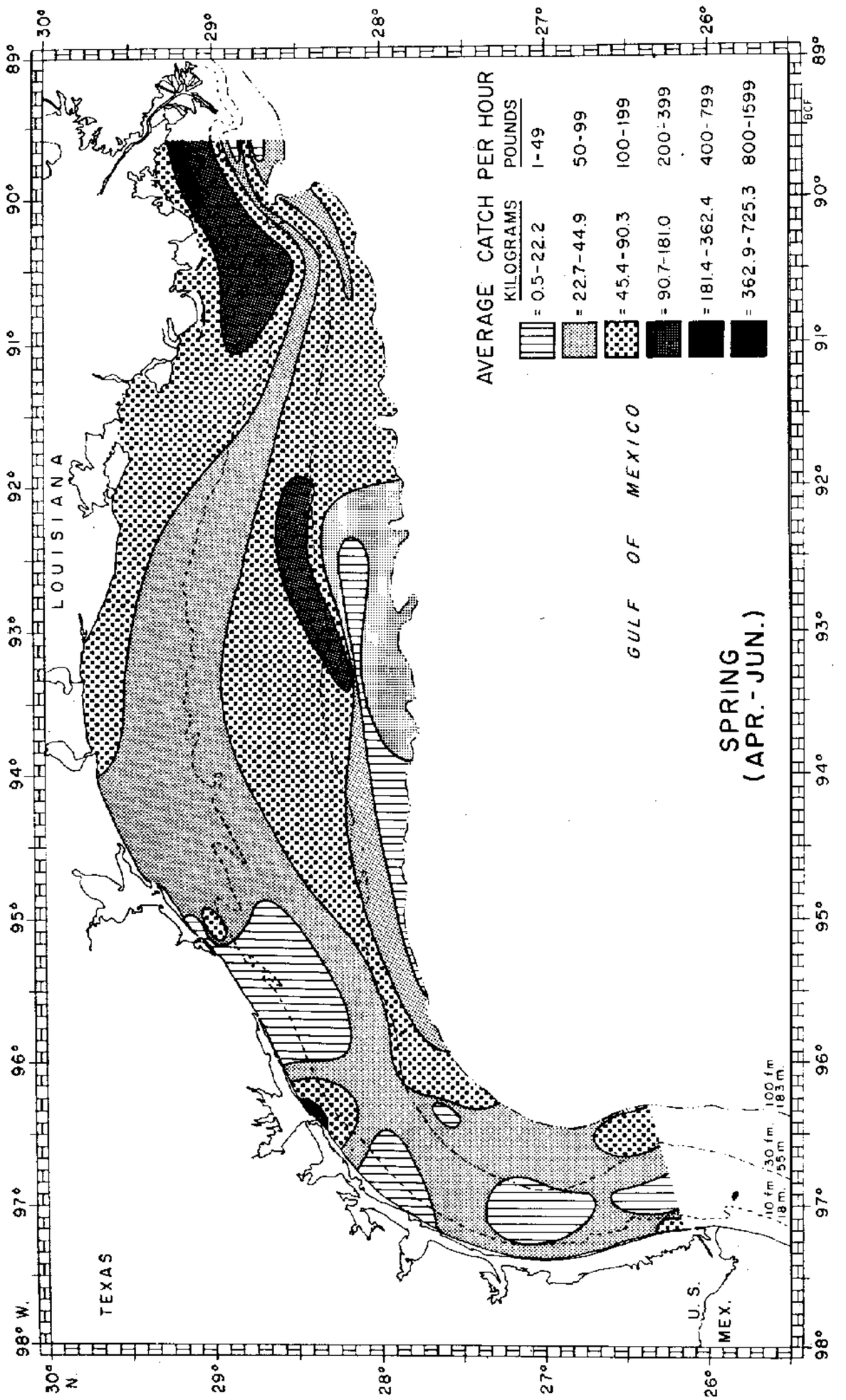

FIG. 3. Relative abundance (by weight) of demersal fishes in the spring (April-June), estimated from the average catch of all fish at each station, 1962–1964.

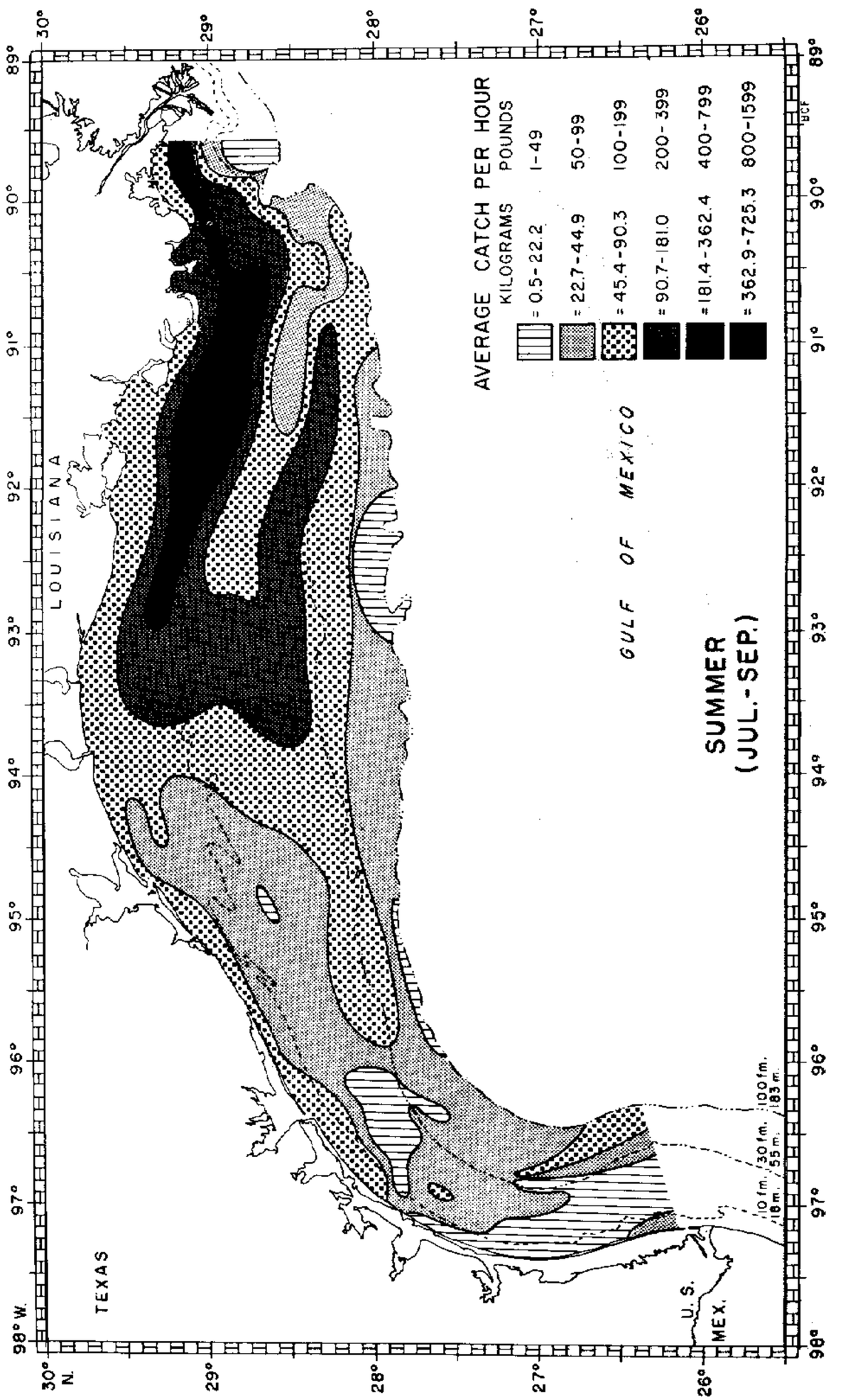

FIG. 4. Relative abundance (by weight) of demersal fishes in the summer (July-September), estimated from the average catch of all fish at each station, 1962–1964.

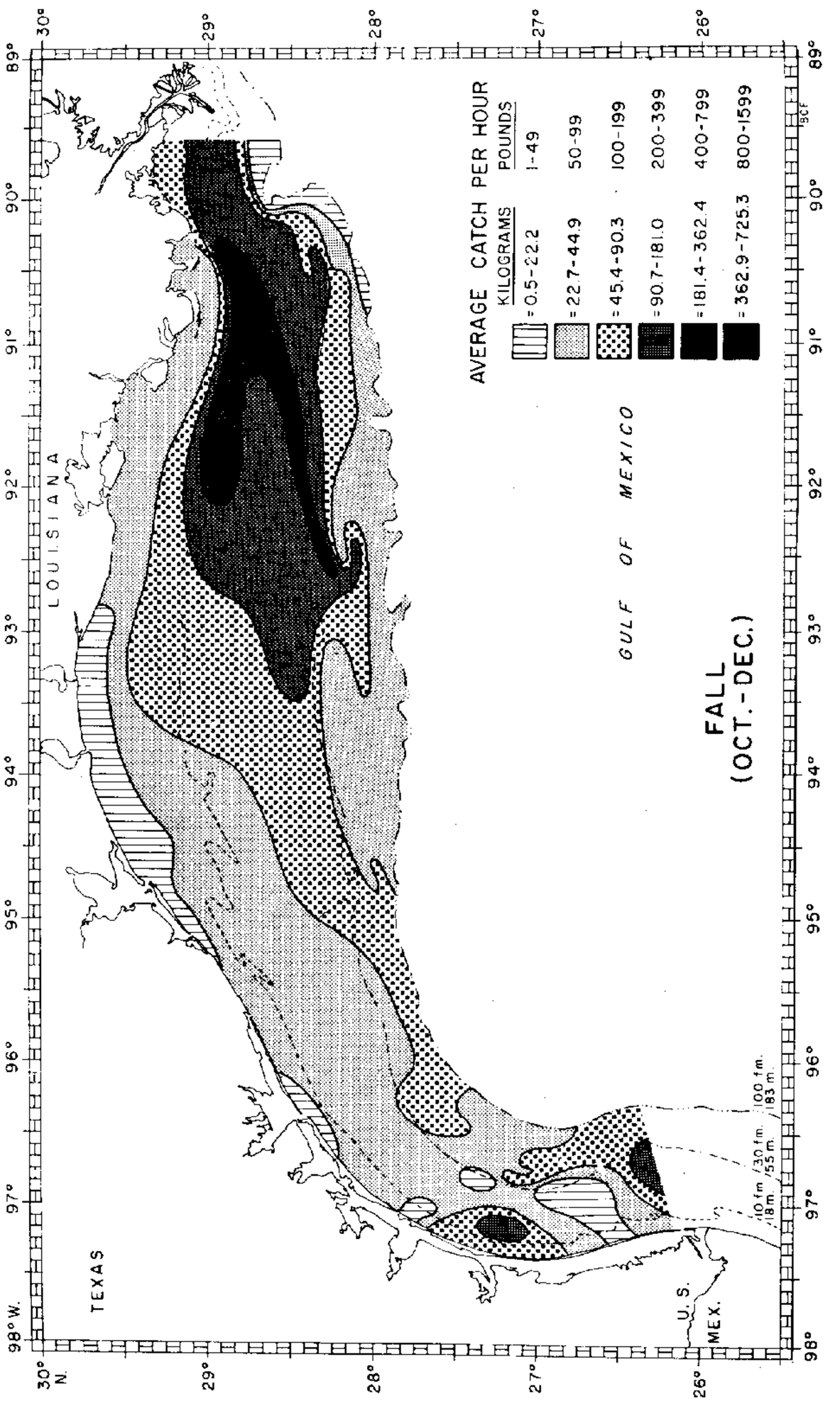

FIG. 5. Relative abundance (by weight) of demersal fishes in the fall (October-December), estimated from the average catch of all fish at each station, 1962–1964.

spring, probably because of recruitment from the estuarine areas (Fig. 4). In the middle zone, there was a moderate increase, in comparison to the winter, off western Louisiana. Abundance in the outer zone in the summer was similar to that in the spring.

In the fall, concentrations in most of the inner zone, especially off western Louisiana, decreased from the summer (Fig. 5). The catches on most of the middle and outer zones were about the same as in the summer but were not as large as in the winter (Fig. 2).

Texas Coast—In the winter, catches in the inner zone were very low (Fig. 2). The fish became more abundant in the deeper parts of the middle zone. The highest concentrations occurred in most of the outer zone.

Abundance in the parts of the inner zone near tidal passes, especially at Pass Cavallo, Stations (W) 56 and 13a, was greater in the spring than in the winter (Fig. 2, 3). The concentrations in the middle zone were similar to the winter, while in most areas of the outer zone they were less than in the winter.

In the summer, the catches in the inner zone off eastern Texas increased from the spring in areas located away from the tidal passes, whereas they decreased off southern Texas (Fig. 4). Abundance in the middle and outer zones changed little.

The concentrations in the fall in the inner zone decreased from the summer off eastern Texas and increased off parts of southern Texas (Fig. 5). In the middle and outer zones, the catches increased off southern Texas near Mexico, and changed little on the rest of the coast from the summer. The greatest change from the fall to the winter was the decrease in abundance along the inner zone (Fig. 2).

SPECIES COMPOSITION

Species of demersal fishes that constituted an estimated one percent or more of the total catch by weight (data from all years and areas combined) are listed in Table 8. The Atlantic croaker, *Micopogon undulatus*, an estuarine species, and the longspine porgy, *Stenotomus caprinus*, an offshore species, dominated the catches. Based on those species which constituted five percent or more of the average total catch in various seasons and depth zones, differences in species composition did exist between catches made off Louisiana and those off Texas (Tables 9 and 10).

The Atlantic croaker, longspine porgy, sand seatrout, *Cynoscion arenarius*, and sea catfish, *Galeichthys felis*, were most abundant in catches off Louisiana when depth zones and seasons were combined (Table 9). The relative abundance of some of the demersal species in each depth zone did vary, however, between seasons. In the inner zone, the catches of croaker and sea catfish ranked first and second in all seasons. In the middle zone, the croaker ranked first and the longspine porgy second during the winter and fall; the rank of these two species was reversed in the spring and summer. Croaker and longspine porgy ranked first and second, respectively, in abundance in all seasons in the outer zone.

Off Texas, longspine porgy, Atlantic croaker, inshore lizardfish, *Synodus foetens*, and silver seatrout, *Cynoscion nothus*, led in abundance when depth zones

TABLE 8

Species that constituted one percent or more of the average catch by weight of all demersal fishes caught off Louisiana and Texas, 1962–64

Species	Percent of total catch		
	Louisiana	Texas	Entire coast
Atlantic crocker, *Micropogon undulatus*	35	9	28
Longspine porgy, *Stenotomus caprinus*	18	21	19
Inshore lizardfish, *Synodus foetens*	3	9	5
Sand seatrout, *Cynoscion arenarius*	5	5	5
Sea catfish, *Galeichthys felis*	5	2	4
Silver seatrout, *Cynoscion nothus*	3	7	4
Blackfin searobin, *Prionotus rubio*	4	2	4
Spot, *Leiostomus xanthurus*	4	4	4
Rock sea bass, *Centropristis philadelphicus*	2	4	3
Atlantic cutlassfish, *Trichiurus lepturus*	2	2	2
Southern kingfish, *Menticirrhus americanus*	1	3	2
Gulf butterfish, *Poronotus burti*	1	4	2
Wenchman, *Pristipomoides aquilonaris*	1	5	2
Shoal flounder, *Syacium gunteri*	1	4	2
Mexican searobin, *Prionotus paralatus*	1	4	2
Mexican flounder, *Cyclopsetta chittendeni*	1	2	1
Star drum, *Stellifer lanceolatus*	1	1	1
Red goatfish, *Mullus auratus*		2	1
Bumper, *Chloroscombrus chrysurus*	1	1	1

and seasons were combined (Table 10). The most abundant species in the inner zone in each season was: southern kingfish, *Menticirrhus americanus*, in the winter and fall; silver seatrout in the spring; and Atlantic croaker in the summer. The second most abundant species in the winter, spring, summer and fall were spot, Atlantic croaker, sand seatrout, and Atlantic croaker, respectively. Longspine porgy ranked first in abundance in the middle zone in all seasons except spring when the inshore lizardfish dominated catches. Species ranking second in abundance were sand seatrout in the winter, longspine porgy in the spring, and Atlantic croaker in the summer and fall. In the outer zone, longspine porgy were the most abundant in all seasons and the inshore lizardfish was the second most abundant species in all seasons except winter when the wenchman, *Pristipomoides aquilonaris*, ranked second.

DISCUSSION

Large catches in the middle zone off Louisiana in the winter (Fig. 2) apparently were a result of Atlantic croakers moving offshore into water where longspine porgies were abundant (Table 9). Gunter (1938, 1945) noted that croakers were scarce in estuaries and along the adjacent coastlines in the fall and winter. The catches off Louisiana in which croaker predominated were made more shoreward in the spring than in the winter, and were generally separated from the catches offshore in which longspine porgy were most abundant (Fig. 3 and Table 9). Large catches, in which croaker predominated, also were made on the inner

TABLE 9

Species that constituted five percent or more of the average catch by weight of all demersal fishes caught off Louisiana, 1962–1964
(Listed by season and depth zone)

	Season									
	Winter (Jan.–March)		Spring (April–June)		Summer (July–Sept.)		Fall (Oct.–Dec.)		All seasons (Jan. Dec.)	
Depth zone	Species	Percent of total catch	Species	Percent of total catch	Species	Percent of total catch	Species	Percent of total catch	Species	Percent of total catch
Inner zone	Atlantic croaker	51	Atlantic croaker	49	Atlantic croaker	48	Atlantic croaker	66	Atlantic croaker	52
7–14 m.	Sea catfish	10	Sea catfish	14	Sea catfish	8	Sea catfish	8	Sea catfish	10
(4–7.5 fm.)	Southern kingfish	7	Sand seatrout	6	Sand seatrout	8			Sand seatrout	6
	Longspine porgy	5	Atlantic cutlassfish	5	Spot	7			Spot	5
			Spot	5	Atlantic cutlassfish	6				
Middle zone	Atlantic croaker	39	Longspine porgy	27	Longspine porgy	29	Atlantic croaker	40	Atlantic croaker	31
27–46 m.	Longspine porgy	22	Atlantic croaker	20	Atlantic croaker	21	Longspine porgy	20	Longspine porgy	24
(15–25 fm.)			Inshore lizardfish	10	Blackfin searobin	5	Silver seatrout	6	Silver seatrout	6
			Atlantic cutlassfish	7			Blackfin searobin	5	Blackfin searobin	5
			Blackfin searobin	7			Spot	5		
			Sand seatrout	6						
Outer zone	Longspine porgy	31	Longspine porgy	38	Longspine porgy	54	Longspine porgy	23	Longspine porgy	35
64–110 m.	Inshore lizardfish	10	Blackfin searobin	11	Mexican flounder	6	Atlantic croaker	12	Blackfin searobin	9
(35–60 fm.)	Atlantic croaker	9	Atlantic croaker	9	Rock sea bass	6	Blackfin searobin	9	Atlantic croaker	8
	Blackfin searobin	8	Rock sea bass	9	Blackfin searobin	5	Sand seatrout	9	Rock sea bass	7
	Rock sea bass	5					Rock sea bass	7	Inshore lizardfish	6
							Spot	7		
Entire shelf	Atlantic croaker	36	Atlantic croaker	28	Atlantic croaker	33	Atlantic croaker	41	Atlantic croaker	35
7–100 m.	Longspine porgy	20	Longspine porgy	19	Longspine porgy	17	Longspine porgy	16	Longspine porgy	18
(4–60 fm.)			Sea catfish	6	Sand seatrout	6	Blackfin searobin	6	Sand seatrout	5
			Sand seatrout	5	Sea catfish	6	Sand seatrout	5	Sea catfish	5
			Inshore lizardfish	5	Spot	5				
			Blackfin searobin	5						
			Atlantic cutlassfish	5						

TABLE 10

Species that constituted five percent or more of the average catch by weight of all demersal fishes caught off Texas, 1962–1964

(Listed by season and depth zone)

	Season									
	Winter (Jan.–March)		Spring (April–June)		Summer (July–Sept.)		Fall (Oct.–Dec.)		All seasons (Jan.–Dec.)	
Depth zone	Species	Percent of total catch	Species	Percent of total catch	Species	Percent of total catch	Species	Percent of total catch	Species	Percent of total catch
Inner zone 7–14 m. (4–7.5 fm.)	Southern kingfish	26	Silver seatrout	26	Atlantic croaker	30	Southern kingfish	23	Atlantic croaker	20
	Spot	19	Atlantic croaker	15	Sand seatrout	9	Atlantic croaker	10	Silver seatrout	14
	Sand seatrout	12	Sea catfish	10	Silver seatrout	7	Sand seatrout	9	Southern kingfish	11
	Silver seatrout	7	Spot	7	Seat catfish	6	Silver seatrout	7	Sea catfish	7
			Southern kingfish	5	Southern kingfish	5	Sea catfish	5	Spot	7
			Atlantic cutlassfish	5			Shoal flounder	5	Sand seatrout	5
							Longspine porgy	5		
Middle zone 27–46 m. (15–25 fm.)	Longspine porgy	38	Inshore lizardfish	15	Longspine porgy	25	Longspine porgy	26	Longspine porgy	27
	Sand seatrout	8	Longspine porgy	15	Atlantic croaker	9	Atlantic croaker	12	Inshore lizardfish	9
	Inshore lizardfish	7	Shoal flounder	14	Inshore lizardfish	9	Shoal flounder	8	Shoal flounder	9
	Shoal flounder	7	Gulf butterfish	11	Silver seatrout	9	Spot	8	Atlantic croaker	7
	Rock sea bass	6	Rock sea bass	9	Sand seatrout	7	Inshore lizardfish	7	Sand seatrout	7
	Atlantic croaker	5	Silver seatrout	6	Shoal flounder	5	Silver seatrout	6	Silver seatrout	5
									Rock sea bass	5
Outer zone 64–110 m. (35–60 fm.)	Longspine porgy	29	Longspine porgy	26	Longspine porgy	26	Longspine porgy	27	Longspine porgy	27
	Wenchman	18	Inshore lizardfish	16	Inshore lizardfish	14	Inshore lizardfish	13	Inshore lizardfish	14
	Inshore lizardfish	12	Wenchman	12	Wenchman	12	Wenchman	12	Wenchman	14
	Mexican searobin	9	Rock sea bass	6	Mexican searobin	8	Mexican searobin	8	Mexican searobin	8
			Mexican searobin	6	Rock sea bass	6	Rock sea bass	5	Rock sea bass	5
Entire shelf 7–110 m. (4–60 fm.)	Longspine porgy	28	Silver seatrout	12	Atlantic croaker	17	Longspine porgy	24	Longspine porgy	21
	Inshore lizardfish	9	Longspine porgy	11	Longspine porgy	15	Atlantic croaker	8	Atlantic croaker	9
	Wenchman	8	Inshore lizardfish	9	Inshore lizardfish	7	Inshore lizardfish	8	Inshore lizardfish	9
	Sand seatrout	6	Gulf butterfish	7	Silver seatrout	6	Sand seatrout	6	Silver seatrout	7
	Mexican searobin	5	Atlantic croaker	6			Shoal flounder	5	Wenchman	5
			Shoal flounder	5					Sand seatrout	5
			Rock sea bass	5						

shelf westward to Texas. Hildebrand (1954) reported that croakers were abundant in trawl catches off the Louisiana-Texas border in June. We made large catches in the inner depth zone along eastern Texas in the summer (Fig. 4), the only season that croakers were most abundant on the inner zone off Texas (Table 10). In the fall, a return toward the winter densities—low in the inner zone off eastern Texas and western Louisiana, and high in the middle zone off Louisiana (Fig. 5)—probably reflected the movement of croakers offshore again (Tables 9 and 10).

In our catches, the species that are definitely associated with the estuaries (*Micropogon undulatus*, *Cynoscion arenarius*, *Galeichthys felis*, *Leiostomus xanthurus*, and *Menticirrhus americanus*) usually had great seasonal variation, probably because they spend part of their life cycle inshore of the area studied. The seasonal variations in catches of species that are never associated with the estuaries (*Stenotomus caprinus*, *Prionotus rubio*, *Centropristis philadelphicus*, *Pristipomoides aquilonaris*, *Syacium gunteri*, *Prionotus paralatus*, *Cyclopsetta chittendeni*, and *Mullus auratus*) were usually much less than those exhibited by the estuarine species.

The average annual concentrations of fish were high at some of the easternmost stations, and decreased markedly to the west (Fig. 6). This area off Louisiana is in the western half of a region that Gunter (1967) has called one of the world's most productive fishery areas.

Most of this area lies within the shelf that van Andel and Curray (1960) reported as having active deposition of silts and clays together with some suspended material brought directly from the Mississippi River by currents. They also indicated that most of the shelf off western Louisiana and eastern Texas is nondepositional and, therefore, has much more sand, while most of the southern Texas shelf has moderate depositional activity due to a north-south convergence of currents carrying sediments from three rivers along the Texas coast. Our study indicated that the area off southern Texas (Fig. 6) may include the northern tip of an offshore concentration of demersal fishes off northern Mexico.

Average catches made in this study are lower than that which a commercial fleet would realize for at least two reasons. First, the fleet fishes with more efficient gear, such as the balloon type trawls described by Bullis *et al* (1960), and, second, fishing practices are more efficient, i.e., fish concentrations are sought out, and, when found, fished repeatedly. To provide fishermen with an indication of how much greater their catches might be, without attempting to adjust for all the variables involved, we have used two reports—one on the commercial catch and the other on some exploratory trawling off part of the Louisiana coast—to make some general comparisons with our data.

Roithmayr (1965) reported the average catch by the industrial demersal fishery during 1959–63 to be 408 kg (900 lb.) per hour, in 13–55 m (7–30 fath) off central Louisiana (89°–91° 25′ W long). In the same area between 14 and 46 m (7.5 and 25 fath) on transects 9–10 during 1962–64, we made an average catch of 138 kg (305 pounds) per hour. The commercial catch in this instance was about three times greater than our catches. Soviet-Cuban investigators (Sal'nikov) 1966) made catches of 200–750 kg (440–1,650 lb.) per hour in 40–80 m (22–44

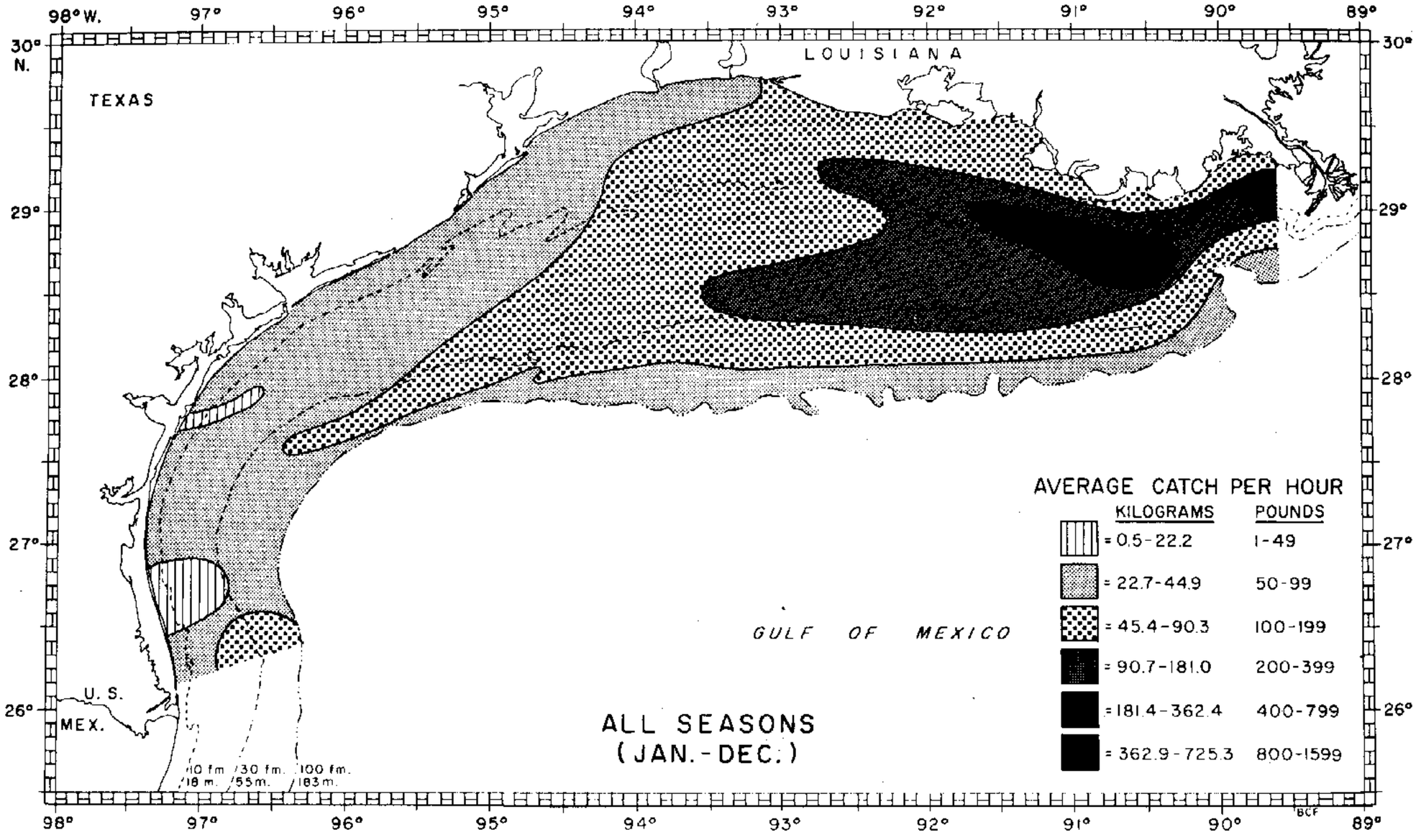

FIG. 6. Relative abundance (by weight) of demersal fishes from 1962–1964, estimated from the average catch of all fish at each station.

fath) off Louisiana (91°–93° W long) during March 1963 with fish trawls. In contrast. our catches averaged less than 159 kg (350 lb.) per hour at each station in the same area during the winter in 1962–64.

Our study indicated that the greatest catches of demersal fishes could have been made in 13–37 m (7–20 fath) off Louisiana between 90°–91° W long during the winter and in 9 to 18 m (5–10 fath) during the summer. Greatest catches in the fall could have been made in 9–37 m (5–20 fath) off Louisiana between 90.5°–92° W long, whereas the best catches in the spring could have been made in 9–18 (5–10 fath) off the Louisiana coast between 89.5°–90° W long. Atlantic croaker would probably have dominated the catches at all the above locations. Any fishery that attempts to catch predominantly longspine porgy would make the best catches during any season in 37–55 m (20–30 fath) off western Louisiana between 92°–93° W long.

SUMMARY

The average catch of bottomfish was about three times greater off Louisiana (93 kg/hr; 204 lb/hr) than off Texas (35 kg/hr; 77 lb/hr). Differences in mean catch between Texas and Louisiana were greatest in the shallow areas and generally became less in deeper water. Catches of bottomfish (species combined) in day and night tows were similar. Differences in abundance between years at a particular station were sometimes great, but not statistically significant. At most stations catches were greatest in 1962 and lowest in 1963. Seasonal differences in abundance were great off Texas and Louisiana. Off Louisiana, the most dense concentrations of fishes were in the winter and summer. Off Texas, the highest concentrations were in the summer and fall. The greatest concentrations of fish were in the inner (2–18 m; 1–10 fath) and middle 20–55 m; 11–30 fath) depth zones off Louisiana, whereas the greatest concentrations occurred in the middle and outer zones off Texas. Atlantic croaker and longspine porgy constituted nearly half of the total catch. Atlantic croaker, longspine porgy, sand seatrout and sea catfish were caught in greatest abundance off Louisiana. Longspine porgy, Atlantic croaker, inshore lizardfish and silver seatrout were predominant in the catches off Texas.

ACKNOWLEDGMENTS

We gratefully acknowledge the assistance given by various staff members in completing this study. We especially wish to note the assistance given by Robert F. Temple and Richard A. Neal in their suggestions and in critically reviewing the manuscript and by John B. Hervey in processing the data.

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